Available online at www.sciencedirect.com

SciVerse ScienceDirect

Procedia Social and Behavioral Sciences 23 (2011) 177–179

Procedia Social and Behavioral Sciences

Academy of Aphasia 2011

Mapping and Comparing Concept Network Structures in Individuals with Aphasia

Feng Lin[a], Zhongli Jiang[a,*]

[a] *The First Clinical Medical School of Nanjing Medical University/The First Affiliated Hospital of Nanjing Medical University*

Objectives

Picture naming tasks are one of the most practicable treatment options for persons with aphasia. The frequencies of correct responses can be applied to evaluate the patient's naming ability. However, it remains unknown how individuals with aphasia organize the connections between the concepts of pictures. Free association tasks are available to detect conceptual associative structures in clinical populations and such structures can be analyzed by network modeling and analysis (Borge-Holthoefer & Arenas, 2010; De Deyne & Storms, 2008). The present study aimed to explore whether network modeling is a potentially useful method for the study of concept structures in individuals with aphasia.

Methods

Naming ability was examined by using two training strategies of picture naming tasks: the semantic sequential naming strategy (SSNS), which presented training pictures in a semantic sequence, and the random sequential naming strategy (RSNS), which showed the same set of pictures in a random sequence. To evaluate the generalization effects of the training, naming ability of untrained pictures was also examined before and after training. The least absolute shrinkage and selection operator (LASSO) for generalized linear models (Osborne, Presnell, & Turlach, 2000) was used to identify conditional dependent connections among the concepts of pictures. The bootstrap method (random resample and confidence interval comparison) was used to enhance the reliability and validity of model selection. By defining the concepts of pictures as nodes and conditional dependent connections as lines, several undirected network models were established. Their structures were measured by k-core decomposition and network visualization (De Nooy, Mrvar, & Batagelj, 2005).

Results

For the concepts of the trained pictures, SSNS improved the naming ability and the learning curve more effectively than RSNS. For the untrained concepts, both the SSNS and the RSNS significantly promoted generalization effects. By comparing the networks before and after training with the same strategy, it was apparent that both the trained and the untrained concepts were more interactively organized by both strategies (see Figure 1). By comparing the networks of the two strategies after training, it seemed that for the trained concepts these two strategies had no significant differences between their cognitive associative structures. However, findings from the untrained concepts suggested that the SSNS generated more stable cognitive associative structures than the RSNS.

* Corresponding author.
E-mail address: jiangzh3721@yahoo.coˆ¢´€´‹m.cn .

doi:10.1016/j.sbspro.2011.09.227

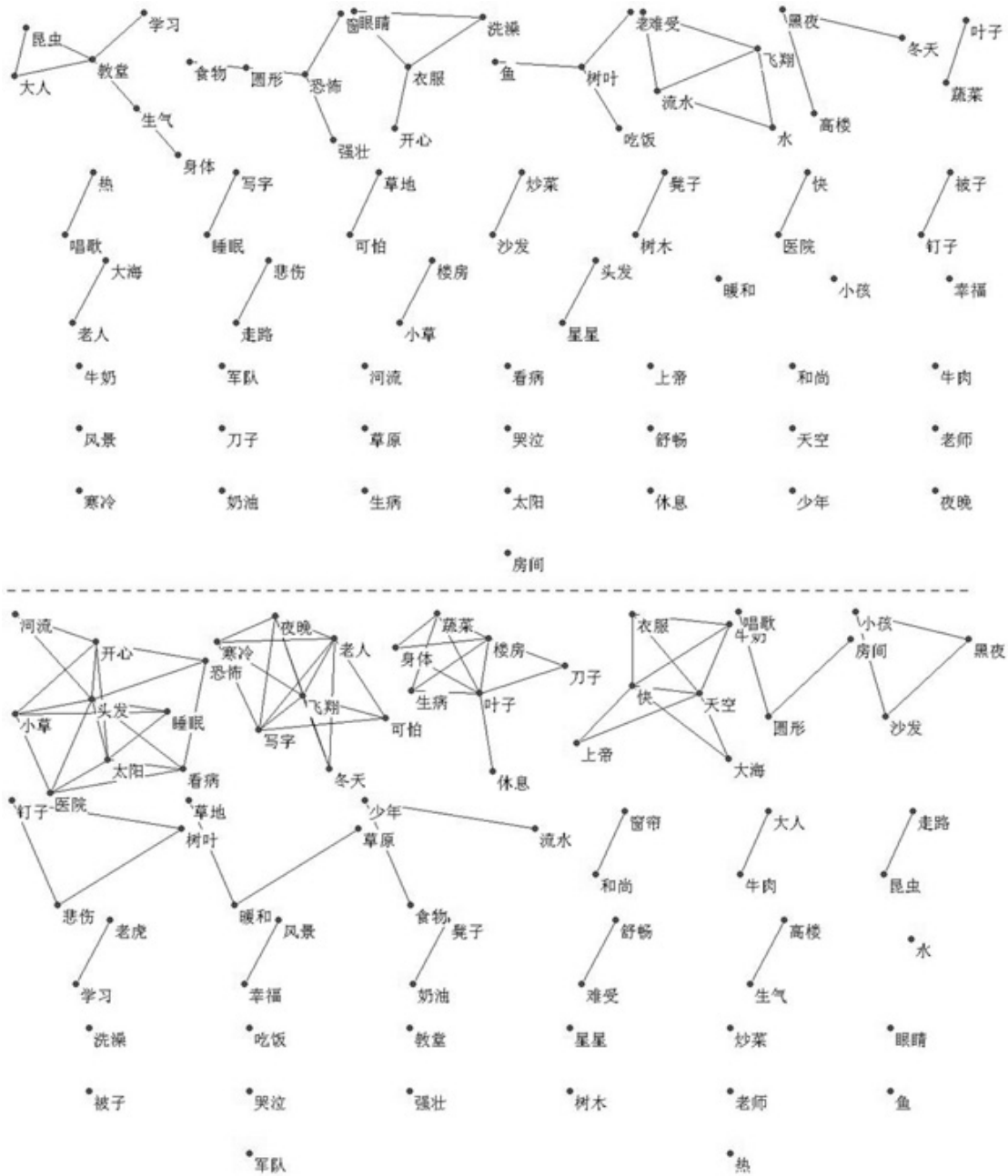

Figure 1. Network modeling of the trained concepts in the semantic sequence naming strategy: before (top panel) and after training (bottom panel). The nodes with labels represent concepts. The lines represent conditional dependent associations among concepts.

Conclusions

Network modeling provided a promising method for mapping concept associative structures in individuals with aphasia. Potential structures revealed by this method made it possible to evaluate and compare pathological concept structures.

References

Borge-Holthoefer, J., & Arenas, A. (2010). Semantic Networks: Structure and Dynamics. *Entropy, 12*(5), 1264-1302.

De Deyne, S., & Storms, G. (2008). Word associations: network and semantic properties. *Behavioural Research Methods, 40*(1), 213-231.

De Nooy, W., Mrvar, A., & Batagelj, V. (2005). *Exploratory Social Network Analysis with Pajek* . New York, NY: Cambridge University Press.

Osborne, M. R., Presnell, B., & Turlach, B. A. (2000). On the LASSO and Its Dual. *Journal of Computational and Graphical Statistics, 9*(2), 319-337.